

REMARKS/ARGUMENTS

I. Specification

In the subject Office Action, the Examiner requested that the term “reference voltage” and “voltage reference” be consistently used in the claims. Upon checking the specification, Applicants found that the term “reference voltage” was used in all places throughout the specification except three exceptions. Hence, the three exceptions were changed from “voltage reference” to “reference voltage”.

II. Claim Objections

In the subject Office Action, the Examiner objected to claims 3-7, 10-14, and 20-24 on a number of grounds. First, claims 1-7, directed to just the reference voltage generator without the rest of the hysteresis circuit, have been cancelled. Second, all use of “a first, a second, and a third” have been deleted. Throughout the claims “reference voltage” is used instead of “voltage reference”, so as to be consistent not only within the claims but also with the specification. Additionally, each place where “generator” or “originator circuit” recites additional elements, the term “further including” is used instead of just “including”. To be consistent, all use of “supply voltage” or “source voltage” was changed to “voltage supply”. These changes were made for both of the remaining sets of claims starting with independent claims 8 and 17.

III. Claim Rejections – 35 USC §112

In the subject Office Action, the Examiner objected to claims 1-7 on a number of grounds under 35 USC §112. Applicants have cancelled these claims.

Additionally, claims 23 and 24 have been amended to be dependent from claim 22 instead of claim 20 so as to provide antecedent basis for the first and second reference voltage nodes.

IV. Claim Rejections - 35 U.S.C. §103

In the subject Office Action, claims 1-3, 8-10, 15-20, and 23-27 were rejected under 35 U.S.C. §103 as being unpatentable over Chao et al in view of Kaneko et al. However, the Examiner indicated that claims 11-14 and 21-22 were only objected to as being dependent upon a rejected base claim and would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Applicants greatly appreciate the Examiner's indication of allowable claims if rewritten. Applicants respectfully request that Examiner reconsider that the claims be rewritten to include all three p-channel devices of the first originator circuit based upon the above amendments made to the claims and the following arguments.

Applicants have amended the independent claims 8 and 17 to recite that the first originator circuit includes a first p-channel device and a second p-channel device coupled in parallel between the first reference voltage node and the voltage supply, but not to recite a third p-channel device. Although not requested by the Examiner, Applicants have further amended the independent claims to recite that the second originator circuit includes a first n-channel device and a second n-channel device coupled in parallel between the second reference voltage node and the ground. Applicants submit that this further definition of the originator circuits in independent claims 8 and 17 distinguishes the originator circuits of Applicants' invention from the various types of reference voltage generators described in Kaneko et al ("Kaneko"), Holzer et al ("Holzer"), Ueda et al ("Ueda"), and the Falconer patents. Moreover, Applicants' invention, as defined by this structure, allows for the functionality described by the following excerpt from Paragraph 0024 of the Applicants' application:

"Referring to FIG. 6, the portion of the reference voltage generator 30 involved with hysteresis control includes not only the selector circuit 36, but also the transistors P2, N2 and N5. For the first originator circuit 32, the transistor P2 modulates or adjusts the first reference voltage generated by the transistors P1 and P3. Likewise, for the second originator circuit 34, the transistors N2 and N4

(transistor N4 is optional) modulate or adjust the second reference voltage generated by the transistors N1 and N3."

None of the prior art references show two parallel channel devices where one is used to adjust the value of the other so as to produce an adjusted reference voltage. More specifically, Kaneko et al, in FIGS. 6A-6D shows a plurality of reference voltage generators having series coupled transistors and in FIG. 3 shows a reference voltage generator using a constant current source. Referring to column 7, lines 38-57 discussing FIG. 3, the reference voltage generating circuit 12 is described as functioning "to generate a voltage with low output-voltage-dependency on the external power supply voltage Vcc and low temperature dependency". It is not the type of reference voltage generator circuit that may be used to generate an adjusted reference voltage, as is undertaken by the parallel first and second p-channel devices and parallel first and second n-channel devices of Applicants' invention. Likewise, referring to column 11, lines 55-67 and column 12, lines 1-7, the reference voltage generating circuits of FIGS. 6A-6D are described as alternative designs for performing the same function as the reference voltage generating circuit 12 discussed with respect to FIG. 3. In Holzer et al, Figures 13 and 5, a current source and two transistors coupled in series with two taps for obtaining two reference voltages. In Ueda, Figure 16, the output from a first stage (two series transistors) is the input to the next stage (two series transistors). In Falconer, three transistors are in series with the position with different positioned taps providing different reference voltages.

As described in paragraph 18 of Applicants' application, the claimed reference voltage generator of Applicants' invention accomplishes the following:

"With reference to FIGS. 3 and 6, the reference voltage generator 30 for the hysteresis circuit 10 is much more tolerant to process and temperature changes and therefore is able to significantly reduce the variation of the reference voltages Vh+ and Vh-. The reference voltage generator 30 reduces the variability of the output reference voltage by using two sets of substantially

identical transistors: one in the first originator circuit 32 for the V_{h+} band and another in the second originator circuit 34 for the V_{h-} band. As compared with the prior art reference voltage generator of FIG. 5, it is anticipated that the reference voltage generator 30 reduces the variation of the reference voltages V_{h+}/V_{h-} by approximately 45%. The reason for this reduction is at least partially attributable to the fact that each band is generated by the same kind of transistor. More specifically, in the illustrative embodiment of FIG. 6, the first originator circuit 32 is formed of p-channel devices (i.e., p-transistors) and the second originator circuit 34 is formed by n-channel devices (i.e., n-transistors). In general, the variability of process parameters is substantially more controlled with one type of transistors than across two different types of transistors. Thus, variation within all n-transistor parameters, which determine its characteristics, impacts all of the n-transistors in the same way. To the contrary, with the prior art reference voltage generator of FIG. 5, process variation could impact the p-channel and the n-channel transistors differently and result in a much larger change in the reference voltages V_{h+} and V_{h-} ."

Dependent claims 9 and 18 recite the third p-channel device which the Examiner indicated would be allowable, although these claims do not provide as much detail as original claims 11 and 21. However, amended claims 11 and 21 do provide the same level of detail as those indicated by the Examiner as being allowable if rewritten to overcome the objections.

With respect to the other references mentioned by the Examiner in his "Prior Art" section, Applicants have addressed above these references with respect to amended independent claims 8 and 17.

V. Conclusion


Applicant greatly appreciates that the Examiner indicated claims 11-14 and 21-22 would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. However, in view of the foregoing amendments and arguments, Applicants respectfully request reconsideration of the amended independent claims 8 and 11, in addition to those claims dependent therefrom.

The Commissioner is hereby authorized to charge shortages or credit overpayments to Deposit Account No. 500393. A Fee Transmittal is enclosed in duplicate for fee processing purposes.

Respectfully submitted,
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